ABOUT YOUR HOUSE

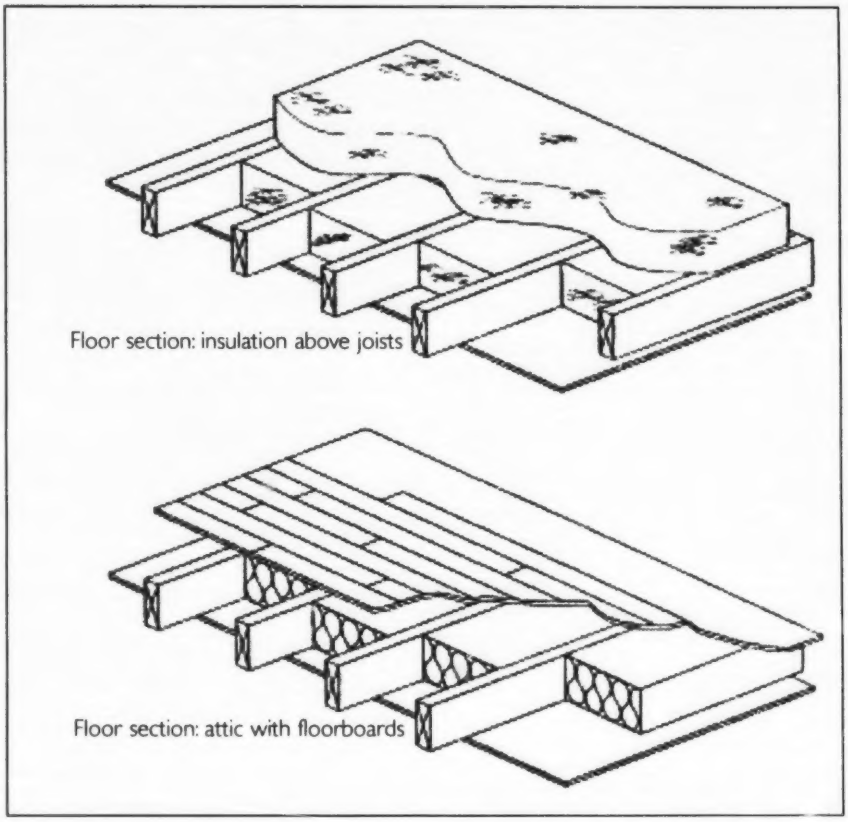
CE13

ATTIC VENTING, ATTIC MOISTURE, AND ICE DAMS

It is rare for Canadians to visit their attics. For many years building codes have required high levels of attic insulation, making attics less-than-hospitable places. People usually go into their attics for one of two reasons: animal intruders, such as bats or squirrels, or water leaking through the top floor ceiling. This guide deals with water entry, such as roof leaks, ice dams, and attic condensation. Consult your local pest control expert to rid the attic of creatures.

What to do if water comes through your ceiling

Find out where the leak is in your ceiling by measuring its location from the nearest outside walls. Then, go into the attic through the attic hatch. It is often hidden in the ceiling of a closet or in the wall of an attached garage. If it is in a closet, move the clothes out of the closet so loose insulation won't stick to them. Take a good flashlight and a tape measure.



Floor section: insulation above joists

Floor section: attic with floorboards

When walking in the attic in older houses, step only on the wooden joists that cover the floor. The joists are usually spaced every 16 inches. They are often hidden under a pile of insulation. If you step off the joists, you will probably put your foot through plaster or drywall

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ceiling below. Many houses, especially in warmer climates, have some type of floorboard over the joists. This makes walking easier but can make air sealing and insulating more complicated.

Most houses built since the 1970s do not have attic rafters and joists, but trusses—usually at 24 inch centres—with the ceiling below attached to the lower chords. Walking in trussed attics is trickier than walking in older attics.

One further caution: if you find a significant amount of animal droppings from bats or birds, do not disturb them. They can grow molds that can cause several illnesses. To clean up droppings, you need good respiratory protection (masks) and clothing that can be bleached or discarded.

Find the water leak. Use the tape measure to roughly locate where the water is dripping through the ceiling below. Lift the insulation in this area to find the pooling water. Sometimes the water runs along the attic floor for quite a distance before coming through the ceiling.

Trace the water to its source. Look for leaks in the roof, especially around chimneys, plumbing vents, and attic vents—anything that penetrates the roof sheathing.

Quite often the roof flashing is defective and needs replacement. If the sheathing (either boards, plywood, or composite board) along the lower edge of the roof is soaked and you can see a corresponding accumulation of ice on top of the roof, ice damming is occurring. This means that water is backing up under the shingles. Shingles are designed only to shed water running down, not up. Ice damming is covered at the end of this guide.

Your inspection may find that leakage is not the problem: the whole attic or part of it may be dripping with condensation or covered with frost. Go to the section on what to do about a wet attic.

Attic condensation and ice damming are related. Both can be caused by warm, moist air leaving the house and entering the attic. Attics will be in good shape if there are no holes, air leaks, or bypasses from the house to the attic and there is sufficient insulation to keep house heat from escaping. If you can ensure good air sealing and insulation, the attic will remain cool and dry, as if it were outside. For example, it is rare to see moisture problems or ice damming on the roof of a detached garage or unheated barn.

What to do about a wet attic

There are many signs that an attic is wet. Prolonged wetness will rot out the roof sheathing. Often this is first noticed when re-shingling. If you have ceiling leaks only in the spring, it may be that ice has been forming on the sheathing all winter and it suddenly melts when a warm spell arrives. You may see water stains or evidence of mold on the sheathing, rafters, or trusses when you are inspecting the attic. You may find the insulation has been packed down or stained by water or ice. The smell of a moldy attic will enter the house under certain weather conditions, usually in summer.

The usual response is to increase attic ventilation. This is the wrong approach. In some cases, adding ventilation will actually pull more moist house air up into the attic and make the problem worse. The best way to fix a wet attic is to stop air movement from the house. Once this is done, the existing ventilation is usually more than enough to keep the attic dry.

It is important to stop air leaks because a heated house is much like a chimney. Both a house and chimney are containers of warm air surrounded by cold air. Both tend to draw air in at the bottom and expel it at the top. All winter, a heated house is trying to push air through the top floor ceiling into the attic. Block up those air leaks and keep the warmth in the house to save both energy costs and damage to your attic.

Air leaks are usually found at penetrations or discontinuities. Safety regulations prevent sealing of many types of pot lights in top floor ceilings. House air is dumped into the attic through them. Choose sealed pot lights or avoid them on the top floor.

Bathroom fans need to be ducted outside. Make sure that they are properly vented. If the ducts are located in the attic, ensure that there are solid metal rather than flex duct, insulated, and sloped to the outside. Do not wrap the insulation in plastic as this will trap moisture. Taping the duct joints, or

sealing them with mastic, is helpful for controlling leakage.

Plumbing stacks and chimneys are often sources of air leakage. Seal these where they pass through the attic floor. For metal chimneys inside a chase or for old masonry chimneys, you may need help from an expert to ensure proper sealing and avoidance of fire hazards. Seal holes made for electrical wiring and cable installations.

There will be little air leakage in the middle of sheet of drywall or in the middle of an unbroken plaster ceiling. There may be many air leaks where partition or bearing walls meet the ceiling or around the perimeter of the house where the attic floor (or top floor ceiling) meets the outside walls.

All discontinuities should be inspected and sealed if necessary. Look for bypasses. They are major air passages from any floor into the attic. Dropped ceilings in the room below will often conceal a direct connection to the attic. Concrete block party walls between row houses often move house air into the attic.

There are several ways to check for these large and unexpected leaks. The blower door tester can pressurize the house with a big fan and amplify the leakage. Searching the attic at night for lights from below can be helpful. Scanning batt insulation for dirty areas which have been filtering the air from below is also useful, although such straining seems to occur less frequently with blown insulation. Sometimes the holes are so big that you can see into the house below.

Some houses have heating or air conditioning ducts or equipment in the attic. These can be the major source of air leakage and heat loss in the attic. Good information on how to seal and insulate these devices has been published in *Home Energy Magazine*, available in some libraries.

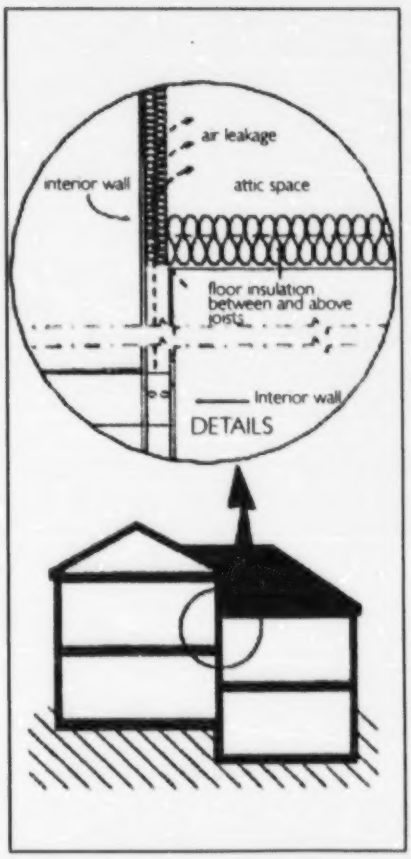
Leaks can be sealed with caulking, expanding foam, plastic, or other methods. There are a number of publications giving details on sealing methods, including *Keeping the Heat In* from Natural Resources Canada 1 800 387-2000 in Canada or (819) 995-2943 outside Canada.

In an older house, the most thorough way to air seal an attic floor is to clear away insulation from each joist bay, and seal all discontinuities. If the attic joists are covered with floor boards, a thorough job includes lifting them to expose the ceiling below. Do this for the entire attic except for areas underlain by unbroken ceilings in a large room. It sounds difficult, but for most attics it should not take more than a day for a two-person crew. Wear good dust masks. Do the work in the fall when the attic is not too hot. Doing only obvious discontinuities without lifting all the insulation can be effective but may result in missing some air leakage paths.

While you are up there, why not put some more insulation down? Make sure that you have at least 300 mm (10 in.) of loose insulation or batts. There are only minor differences in the insulating quality of fiberglass, rock wool and cellulose. They all work well in attics.

Where to look for leaks

- around plumbing stacks or plumbing walls
- chimneys through the attic
- any light fixtures from the ceiling below
- electric wiring
- ducting for fans or heating systems
- perimeter walls
- partition walls
- party walls
- above pocket doors
- above lowered ceilings
- where the side of a cathedral ceiling meets an open attic
- split level discontinuities
- where additions meet an older section of the house
- above rounded corners or staircases
- balloon frame walls



Attic venting

If you have properly sealed the attic you should not need more attic ventilation. Attic ventilation is overrated. In winter, the cold outside air cannot hold much humidity or carry moisture away from the attic. In summer, attic temperatures are more affected by the sun and shingle colour than by the amount of ventilation.

Recent research shows that identical attics, one unvented and the other vented to code, have much the same humidity and temperature. Computer models show that attics in damp coastal climates may actually be drier with less ventilation.

Building codes require attic ventilation. Ventilation may make a difference in a borderline situation. Attic ventilation is driven primarily by wind. To ensure thorough venting, have openings at the soffits and then higher on the roof at the ridge, gable end, or high on the roof surface. The requirements for attic vent sizing is nominally 1:300 (or one sq. ft. of vent size for every 300 sq. ft. of attic floor area). If you wish to improve your attic venting, ensure that it is as well distributed as possible. Do not worry about meeting the 1:300 requirement exactly.

Vents should be screened to keep out animals and insects. If you're using soffit vents, make sure that there is a space between the roof sheathing and the insulation for the ventilation air to pass. Commercially available plastic or cardboard forms can be used, or the extruded polystyrene board option described in the ice damming section.

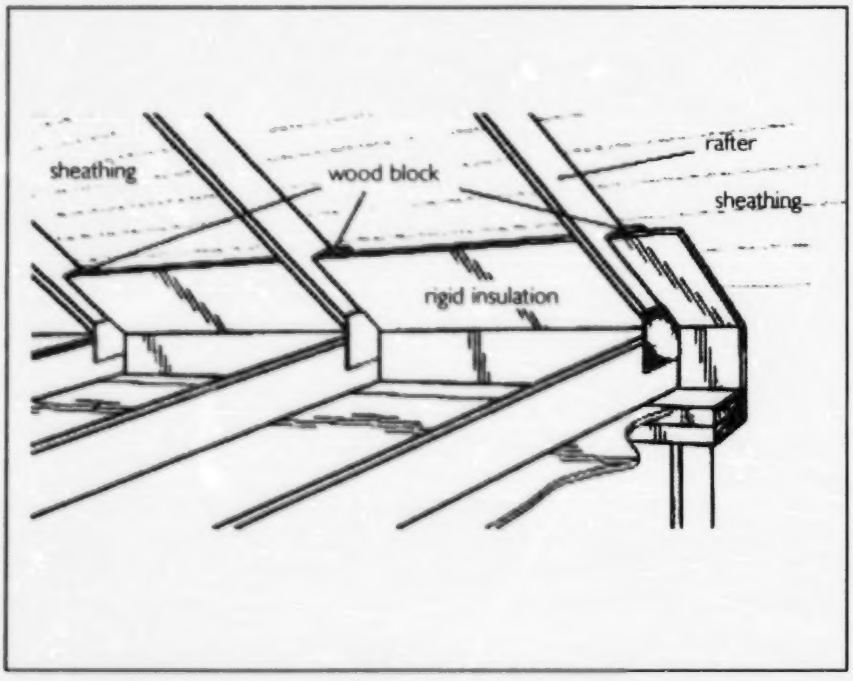
Ice damming

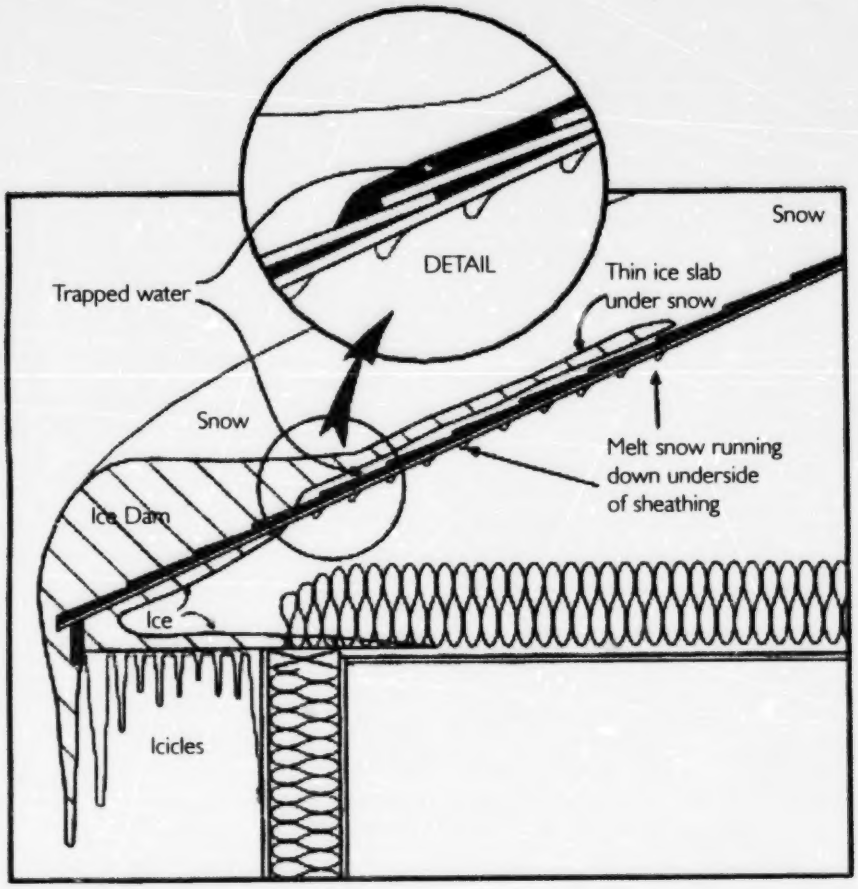
Ice dams are the large mass of ice that collects on the lower edge of the roof or in the gutters. As more rain or melting snow runs down the roof, it meets this mass of ice and backs up, sometimes under the shingles and into the attic or the house.

Ice damming usually occurs with a significant depth of snow on the roof. If the attic temperature is above freezing, it warms the roof sheathing which melts the snow lying on the shingles. This water runs down the roof until it meets the roof overhang, which is not warmed by the attic and will be at the temperature of the surrounding air. If the air and the overhang are below freezing, then the water will freeze on the roof surface and start the ice dam.

An attic with no insulation will generally not have a problem with ice dams. The heat coming through the attic will tend to melt snow off as it lands and prevent much accumulation. A well- sealed and insulated attic will generally not have ice dams. Like the example of a detached garage, this generally results in a cool roof and no great amount of melting. Ice dams are more frequent if the roof is complicated by many valleys and dormers or there is a large roof overhang.

Ice dams will first show up where there is inadequate insulation or major air leaks. One way to find these locations is to look at the roof after the first heavy frost in fall or light snow. Watch where the snow melts off first and find out what is under that spot on the roof. One common sight in such conditions is a horizontal melt line across the roof of a storey-and-a-half house, where the short knee wall meets the ceiling. Other places are beneath a roof-ducted exhaust fan or over a leaky attic access hatch.





The basic relief for ice damming is to seal all attic air leaks and insulate thoroughly—the same as the attic condensation solution.

Many attics, including those under low-sloped roofs, do not have enough space for adequate insulation at the edge of the attic floor. If soffit insulation requires a baffle to keep a ventilation opening against the sheathing, often there will be only 100 mm (4 in.) of space for insulation. This will tend to melt the snow off just above the overhang and promote ice damming. Try to put the best insulation possible at that edge to reduce heat loss. Blown foam is ideal as it air seals as well as insulates.

Cut pieces of extruded polystyrene will help as well. Mount a piece of extruded polystyrene 25 mm (1 in.) from the sheathing to maintain the ventilation air space and fill between this board and the attic floor with good insulation.

Ice dams caused by cathedral ceilings are more difficult. The same principles apply to preventing ice dams—stopping house air leaks, good insulation, perhaps ventilation—but cathedral ceilings are harder to get to. If you have ice dam problems with cathedral ceilings, you can fix the problem when re-roofing. Remove the sheathing, seal and fill the cavities with insulation, and replace the roofing materials. A well-sealed roof will not need ventilation. If you are uncertain whether the ceiling can be done effectively, leave a ventilation channel under the sheathing from the soffit to the peak. Sometimes insulation can be added to the ceiling inside, although this approach will not catch the air leakage.

An extensive and expensive ice dam solution is to make the roof impermeable by using a self-sealing membrane under the shingles. Building codes require such membranes on the lower part of the roof in new houses. Note that these membranes do not stop ice dams, they just prevent the water from leaking through the roof sheathing. Ice damming can still create an unsightly ice build up and possible damage to shingles and gutters, but you may be spared the leakage into the house.

Do all these ice damming solutions sound like too much work? There are many quicker solutions that are popular, but in the end have drawbacks. You can attach electric cables which will melt channels in the ice, sometimes alleviating a problem. Cables use a significant amount of electrical energy as well as being an eyesore on most roofs.

Removing gutters will keep them from becoming ice traps, but gutters are valuable: they keep roof water away from your basement. Attacking ice dams every winter with an ax or ice pick is a good way to shorten shingle life—and a good opportunity to fall off a ladder. At least one person has had success with filling nylon stockings with salt and laying them in the

gutter. Some corrosion and environmental damage may result.

For some older houses with complicated roofs, it may be impossible to completely eliminate ice dams without resorting to some of the methods above. However, for most houses, the preferred solution is to keep house heat out of the attic, by air sealing and insulating. Spend the time to fix it properly and you will not have to worry about it again while you live in that house.

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